

CLAIMS

1. A semiconductor device having an additional functional element comprising:

5 a semiconductor element, at least on one face of which first and second electrodes are arranged;

a wiring board having first and second connection pads on a face of which the semiconductor element is mounted;

10 connection means for electrically connecting the first electrode with the first connection pad so that a small gap can be formed between the one face of the semiconductor element and the mounting face of the wiring board when the one face of the semiconductor element is arranged being directed toward
15 the mounting face of the wiring board; and

an element having a specific additional function arranged in the gap formed between a region of the second electrode of the semiconductor element and a region of the second connection pad of the wiring board,
20 wherein

the additional functional element is connected with the second electrode on the one face thereof and also connected with the second connection pad on the other face thereof so that a specific electric
25 function can be exhibited.

2. A semiconductor device according to claim 1, wherein the connection means is a solder bump, one face of the additional functional element is connected with the second electrode by means of ultrasonic connection,
30 anisotropic conductive adhesive film or anisotropic conductive adhesive paste, and the other face of the additional functional element is connected with the connection pad by means of soldering.

3. A semiconductor device according to claim 1,
35 wherein a plurality of electrodes for signal use, which are used as the first electrodes, are arranged in an outer peripheral region on one face of the semiconductor

element, electrodes for electric power supply and for grounding, which are used as third and fourth electrodes, are arranged in a central region other than the second electrode, the additional functional element is arranged
5 in the gap defined between the central region of the semiconductor element and the wiring board, and the third and the fourth electrodes are electrically connected with third and fourth connection pads on the wiring board through a plurality of conductive vias penetrating from
10 one face of the additional functional element to the other face thereof.

4. A semiconductor device according to claim 1, wherein the additional functional element is an extremely thin type passive element or active element, or
15 alternatively the additional functional element is an extremely thin type capacitor, resistor or inductance.

5. A method of manufacturing a semiconductor device having an additional functional element, said method comprising the following steps of:
20 mounting an additional functional element on a semiconductor element having first and second electrodes at least on one face thereof so that one face of the additional functional element can be connected with the second electrode of the semiconductor element;
25 and

mounting the semiconductor element on a wiring board having first and second connection pads on a semiconductor mounting face thereof, so that the other face of the additional functional element is connected
30 with the second connection pad of the wiring board; and simultaneously connecting the first electrode of the semiconductor element with the first connection pad via a connection means so that the additional functional element is interposed between the one face of the
35 semiconductor element connected with the additional functional element and the mounting face of the wiring board.

6. A method of manufacturing a semiconductor device according to claim 5, wherein one face of the additional functional element and the second electrode of the semiconductor element are connected to each other by means of ultrasonic connection, anisotropic conductive adhesive film or anisotropic conductive adhesive paste when the additional functional element is mounted on the semiconductor element.

7. A method of manufacturing a semiconductor device according to claim 5, wherein the connection means is a solder bump, the first electrodes of the semiconductor element and the first connection pads on the wiring board are connected to each other via the solder bumps, and the other face of the additional functional element and the second connection pads on the wiring board are connected to each other in a flip chip step simultaneously by means of soldering connection of the solder balls.

8. A method of manufacturing a semiconductor device according to claim 7, wherein a plurality of electrodes for signal use, which are used as the first electrode, are arranged in an outer peripheral region on one face of the semiconductor element, electrodes for electric power supply and for grounding, which are used as third and fourth electrodes, are arranged in a central region other than the second electrode, the additional functional element has a plurality of conductive vias penetrating from one face to the other face thereof, the electrodes for supplying electric power and for grounding are connected to one side of the vias by means of ultrasonic connection, anisotropic conductive adhesive film or anisotropic conductive adhesive paste, and the other side of the vias of the additional functional element and the third and the fourth connection pads on the wiring board are connected to each other by means of soldering simultaneously with the flip chip step.